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CHARACTERISTICS OF CHROMATIC AND ACHROMATIC COLORS: A COGNITIVE-SEMANTIC ANALYSIS IN ENGLISH AND KARAKALPAK LANGUAGES

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Abstract. This article explores the cognitive-semantic characteristics of chromatic and achromatic color terms in English and Karakalpak languages. The study investigates how speakers of different linguistic systems conceptualize, categorize, and lexicalize colors, with special attention to perceptual, cultural, and linguistic factors. The research demonstrates that while both languages share universal perceptual foundations of color cognition, they differ significantly in lexical categorization, semantic extension, and metaphorical usage of color terms. The findings contribute to cross-linguistic semantics, cognitive linguistics, and cultural linguistics by revealing how language shapes color perception and conceptualization.

Key words: chromatic colors, achromatic colors, cognitive semantics, color perception, English language, Karakalpak language, linguistic relativity, color categorization.

Introduction. Color is one of the most fundamental perceptual categories through which humans' structure and interpret the surrounding world. Although the physiological mechanisms of color vision are universal across humanity, the linguistic encoding and semantic interpretation of color categories vary significantly across languages. This intersection between perception, cognition, and language makes color terminology a central topic in cognitive linguistics and semantic studies.

In linguistic research, colors are commonly divided into chromatic colors (hue-based categories such as red, blue, green, yellow) and achromatic colors (black, white, and gray scales). While chromatic colors are closely associated with wavelength variation in the visible spectrum, achromatic colors are primarily defined by brightness and saturation rather than hue. However, in natural language, these scientific distinctions are often extended into culturally embedded meanings, metaphorical interpretations, and symbolic associations.

From a cognitive-semantic perspective, color terms are not merely descriptive labels of physical reality but conceptual tools that reflect how speakers of a language categorize experience. The theory of linguistic relativity suggests that language influences thought patterns and perceptual categorization, including how color distinctions are made and interpreted. This implies that differences in color naming systems across languages may reflect deeper cultural, environmental, and cognitive structures.

English, as a globally dominant language with a highly standardized lexical system, demonstrates a relatively fixed set of basic color terms and extensive metaphorical extensions (e.g., "feeling blue," "black market," "white lie"). In contrast, the Karakalpak language, belonging to the Turkic language family, exhibits a more context-sensitive and culturally grounded system of color naming, where color meanings are often linked to natural environment, traditional worldview, and symbolic associations.

The Karakalpak color system reflects strong ties to nomadic heritage, steppe ecology, and cultural symbolism, where colors such as *qara* (black), *aq* (white), and *kök* (blue/green) often carry dual or even opposing semantic values depending on context. This makes the comparative study of English and Karakalpak color systems particularly valuable for understanding how universal perceptual categories are linguistically and culturally shaped.

The relevance of this research is further reinforced by the growing interest in cross-linguistic semantics, cognitive categorization, and cultural linguistics. Despite extensive studies on color terminology in Indo-European languages, Turkic languages—particularly Karakalpak—remain underrepresented in cognitive-semantic research.

Therefore, the aim of this study is to conduct a comparative cognitive-semantic analysis of chromatic and achromatic color terms in English and Karakalpak languages, focusing on their lexical structure, semantic extension, and metaphorical usage. The study seeks to reveal how different linguistic systems encode perceptual reality and how cultural cognition shapes color interpretation. In doing so, this research contributes to a deeper understanding of the relationship between language, cognition, and culture, particularly in the domain of color semantics.

Literature Review. The cognitive-semantic study of color terminology represents a well-established interdisciplinary field that integrates insights from linguistics, cognitive science, anthropology, and psychology. Color terms are not merely lexical items referring to physical wavelengths of light but are conceptual categories shaped by human perception, cultural experience, and linguistic structure.

One of the foundational contributions to this field was made by Brent Berlin and Paul Kay in their seminal work *Basic Color Terms: Their Universality and Evolution*. They proposed that languages develop color terms in a relatively universal evolutionary sequence, beginning with achromatic distinctions (black and white), followed by red, and later expanding to additional chromatic categories such as green, yellow, and blue. Their theory strongly supports the idea that color categorization is grounded in universal human perception.

However, this universalist model has been significantly revised and challenged by later cognitive and linguistic research. Eleanor Rosch introduced the prototype theory, arguing that color categories are structured around prototypical examples rather than fixed boundaries. According to this view, cognitive categorization of colors depends not only on perceptual salience but also on cognitive economy and cultural experience, meaning that different languages may emphasize different focal colors within the same perceptual spectrum.

Further theoretical development in cognitive linguistics was provided by George Lakoff, who emphasized the role of embodied cognition and conceptual metaphor in linguistic meaning. From this perspective, color terms extend beyond perceptual description and function as metaphorical tools for structuring abstract domains such as emotion, morality, and social hierarchy. Expressions like “black mood,” “white lie,” and “green energy” illustrate how color categories are systematically mapped onto conceptual domains in English.

In addition to cognitive-linguistic approaches, ethnolinguistic and anthropological studies have demonstrated significant cross-cultural variation in color semantics. Research shows that while perceptual discrimination of colors is biologically universal, linguistic categorization and semantic extension are highly culture-dependent. Environmental factors, social organization, and symbolic traditions all contribute to shaping how color terms are used and interpreted.

Within Turkic linguistics, studies indicate that color terminology often reflects ecological and cultural environments rather than purely perceptual distinctions. In languages such as Karakalpak, color terms frequently carry layered meanings that combine visual reference with symbolic and emotional associations. For instance, terms equivalent to “black,” “white,” and “blue/green” often extend into domains of morality, spirituality, and identity.

By contrast, English color semantics exhibits a high degree of lexical standardization and metaphorical productivity. Color terms are frequently used in idiomatic expressions and institutionalized metaphors, such as “red tape” (bureaucratic complexity), “white-collar” (professional class), and “black market” (illegal economy). This reflects a highly abstract semantic system in which color terms function as stable conceptual markers across different discourse domains.

Recent advances in corpus linguistics and computational semantics have further expanded the study of color terms by enabling large-scale analysis of real language use. These methods allow researchers to examine frequency patterns, contextual variation, and pragmatic functions of color terms across different genres of discourse, providing a more dynamic understanding of semantic behavior.

Neurocognitive research also contributes to this field by showing that while the physiological mechanisms of color perception are universal, linguistic categorization of colors is influenced by language-specific encoding systems. This supports a moderate version of linguistic relativity, suggesting that language shapes cognitive categorization without determining perceptual ability.

In summary, existing literature demonstrates that color terminology is a multidimensional phenomenon shaped by universal perceptual mechanisms, cognitive categorization processes, and culturally specific semantic extensions. Despite extensive research on English color semantics, comparative cognitive-semantic studies involving Turkic languages such as Karakalpak remain limited. This gap highlights the need for further cross-linguistic investigation, particularly in the domain of chromatic and achromatic color conceptualization, which this study aims to address.

Table 1. Comparative Cognitive-Semantic Features of Chromatic and Achromatic Color Terms in English and Karakalpak Languages

Color Category	English Semantic Features	Karakalpak Semantic Features	Cognitive-Semantic Interpretation
Chromatic colors (red, blue, green, yellow)	Highly standardized meanings; strong metaphorical extensions (e.g., emotions, politics, economy); abstract conceptual usage	Environmentally and culturally grounded meanings; strong association with nature and traditional worldview; limited but meaningful metaphorical use	English shows higher abstraction and institutional metaphorization, while Karakalpak reflects contextual and ecological conceptualization
Achromatic colors (black, white, gray)	Stable symbolic meanings (black = negativity/power, white = purity, gray = neutrality); extensive idiomatic use in discourse	Dual or context-dependent meanings (qara = strength/mourning, aq = purity/sacredness, boz = aging/neutrality); culturally embedded symbolism	Karakalpak demonstrates semantic flexibility and cultural duality, while English shows standardized metaphorical mapping
Metaphorical productivity	Very high; widely used in idioms and institutional discourse (e.g., “black market”, “white-collar”)	Moderate; mainly cultural, emotional, and traditional contexts	English color semantics is more abstract and systematized
Cognitive grounding	Strong conceptual abstraction; dominance of conceptual metaphor theory	Strong embodiment in cultural experience and natural environment	English favors conceptual generalization, Karakalpak favors experiential meaning

This table presents a comparative analysis of chromatic and achromatic color terms in English and Karakalpak languages. It highlights differences in semantic abstraction, metaphorical extension, and cognitive grounding. The analysis shows that English color semantics is more standardized and abstract, while Karakalpak color semantics is more context-dependent and culturally embedded.

Discussion. The findings of this study demonstrate that chromatic and achromatic color terms in English and Karakalpak languages are shaped by a complex interaction of perceptual universals, cognitive categorization mechanisms, and culturally embedded semantic extensions. While human color perception is biologically universal, the linguistic representation and conceptual interpretation of colors vary significantly across the two languages analyzed.

One of the key outcomes of the analysis is that English exhibits a highly standardized and lexically stabilized color system, particularly in relation to basic color terms. Chromatic colors such as *red, blue,* and *green* are consistently used across contexts and demonstrate a strong tendency toward abstract metaphorical extension. For instance, *red* is associated with danger or urgency, *blue* with sadness or calmness, and *green* with growth or permission. Similarly, achromatic colors such as *black* and *white* have developed extensive idiomatic and institutional meanings (e.g., *black market, white lie, white-collar*). This suggests that English color semantics operates within a highly conventionalized cognitive framework in which metaphorical mappings are systematically entrenched in discourse.

In contrast, Karakalpak color semantics displays a more context-sensitive and culturally grounded structure. Color terms such as *qara* (black), *aq* (white), and *kök* (blue/green) are not only visual descriptors but also carry culturally embedded symbolic meanings that vary depending on situational and discourse context. For example, *aq* may symbolize purity and honesty, while in certain contexts it may also represent sacredness or social approval. Similarly, *qara* can signify mourning or negativity, but it may also represent strength, depth, or connection to the earth. This semantic flexibility indicates that Karakalpak color terms are deeply integrated into cultural cognition and traditional worldview systems.

A significant finding of this study is that chromatic colors tend to show higher degrees of metaphorical abstraction in English than in Karakalpak, whereas achromatic colors demonstrate stronger cultural duality in Karakalpak than in English. This suggests that English color semantics is more conceptually generalized, while Karakalpak color semantics is more situationally adaptive.

From a cognitive-semantic perspective, these differences can be explained through the interaction of embodied cognition and cultural modeling of experience. As proposed in cognitive linguistics, color terms are not purely perceptual labels but conceptual structures shaped by recurring bodily and environmental experiences. George Lakoff argues that conceptual metaphors arise from embodied experience, which explains why color terms frequently extend into emotional and social domains across languages.

The results also support a moderate interpretation of linguistic relativity, suggesting that while perceptual color discrimination is universal, linguistic categorization and semantic extension are language-specific. English tends to categorize colors into stable conceptual domains, whereas Karakalpak allows for more fluid and context-dependent semantic interpretation. This difference reflects broader typological distinctions between highly standardized global languages and culturally embedded indigenous languages.

Another important aspect revealed in this study is the role of environmental and ecological factors in shaping color semantics. Karakalpak color terminology reflects the natural environment of the region, including steppe landscapes, desert ecology, and traditional nomadic life. These environmental influences contribute to the semantic richness and variability of color

terms. In English, however, industrialization and institutional discourse have contributed to the abstraction and conventionalization of color meanings.

Furthermore, the study highlights that metaphorical productivity is more extensive in English, particularly in institutional, political, and economic domains. Color terms in English frequently function as cognitive shortcuts for complex abstract concepts, whereas in Karakalpak, metaphorical usage remains more closely tied to cultural narratives and traditional symbolic systems.

Despite these differences, both languages share fundamental cognitive mechanisms, including categorization, metaphorization, and prototypical structuring of color concepts. This confirms that while linguistic expression varies, underlying cognitive processes remain universally grounded.

Overall, the comparative analysis indicates that color semantics is a multidimensional phenomenon shaped by:

- universal perceptual mechanisms
- cognitive categorization processes
- cultural-symbolic systems
- environmental and ecological context
- discourse and pragmatic usage

In conclusion, the differences between English and Karakalpak color systems do not represent opposing models but rather different points on a continuum of cognitive and cultural encoding of color experience. This underscores the importance of integrating cognitive linguistics and cultural semantics in cross-linguistic studies of color terminology.

Conclusion. This study investigated the cognitive-semantic characteristics of chromatic and achromatic color terms in English and Karakalpak languages. The comparative analysis demonstrated that although human color perception is universal at the physiological level, the linguistic representation and semantic interpretation of color categories vary significantly across the two languages. The findings indicate that English color terminology is highly standardized and demonstrates extensive metaphorical and idiomatic expansion, particularly in institutional, emotional, and socio-economic domains. Chromatic colors such as *red, blue,* and *green* show strong abstract semantic extensions, while achromatic colors such as *black* and *white* function as stable conceptual markers in various discourse contexts. In contrast, Karakalpak color semantics is more context-dependent and culturally grounded. Color terms such as *qara*, *aq*, and *kök* carry multiple layers of meaning, including visual, symbolic, emotional, and cultural associations. This flexibility reflects the strong influence of environmental factors, traditional worldview, and cultural cognition in shaping lexical semantics. The study also confirms that both languages rely on universal cognitive mechanisms such as categorization, prototypical structuring, and conceptual metaphor. However, the degree of abstraction and semantic generalization differs: English tends toward conceptual standardization, whereas Karakalpak exhibits culturally embedded semantic variability. Overall, the research supports a moderate view of linguistic relativity, suggesting that while perception of color is biologically universal, its linguistic categorization and semantic extension are shaped by language-specific and culture-specific factors. The study contributes to cognitive semantics, cross-linguistic color research, and cultural linguistics by highlighting the interaction between language, cognition, and cultural experience.

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